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Review Article

Tarenaya longicarpa (Soares Neto & Roalson): Integrative Review on Pharmacological Activities and Use in Traditional Medicine

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Abstract

The Cleomaceae family, revised by Iltis and Cochrane, includes several genera, among them *Tarenaya*, whose pharmacological potential has been widely studied. This article reviews the medicinal and pharmacological properties of the species *Tarenaya longicarpa* (synonyms *Cleome spinosa* and *Tarenaya spinosa*), popularly known as mussambê, highlighting its uses in traditional and scientific medicine. In folk medicine, *T. longicarpa* is used to treat asthma, cough, bronchitis, fever, and inflammations. Studies confirm that its extracts possess anti-inflammatory, antimicrobial, antioxidant, anticancer, and anthelmintic activities, as well as larvicidal and insecticidal properties. The plant contains secondary metabolites such as flavonoids, tannins, saponins, and terpenes, which act against pathogenic microorganisms and have therapeutic relevance. The methodology involved a bibliographic review in scientific databases, using specific descriptors related to the species and its medicinal potential. The analysis of the articles revealed that the essential oil from the leaves significantly inhibits bacteria like *Streptococcus pyogenes*. However, the efficacy of the extracts varies depending on the solvent used. Although the scientific literature demonstrates the multiple uses of *T. longicarpa* and its relevance as a phytotherapeutic agent, the authors emphasize the need for further ethnobotanical and pharmacological research to deepen the understanding of its therapeutic properties and promote its safe and effective use.

Keywords: *Cleomaceae, Mussambê, Cleome spinosa, Medicinal plant*

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1. Introduction

The Cleomaceae family is described taxonomically by Iltis and Cochrane [1] and encompasses several genera, including *Andinocleome* Iltis & Cochrane, *Podandrogyne* Ducke, *Mitostylis* Raf., *Physostemon* Mart. & Zucc., *Tarenaya* Raf., *Cleoserrata* Iltis, *Hemiscola* Raf., *Peritoma* DC., *Corynandra* Schrad. ex-Spreng., *Polanisia* Raf., *Gynandropsis* DC., and *Cleome* L. [2 - 4]. The genus *Cleome* includes approximately 150 species of herbaceous plants, shrubs, and trees, 28 of which are native to Brazil and widely distributed, preferably in open areas. Proposed by Rafinesque in 1838 [5], the genus remained unused in subsequent taxonomic studies and was considered a synonym of *Cleome* L. for nearly 150 years. However, phylogenetic studies demonstrated that *Cleome* is not a monophyletic genus, prompting Iltis & Cochrane [3] to reestablish *Tarenaya* based on morphological characteristics. Although the authors estimated that *Tarenaya* encompasses approximately 40 species, no formal delimitation of the genus was proposed.

Plants of the genus *Cleome* have both medicinal and ornamental applications [6]. Traditionally, several species within the genus are used as antiscorbutics, anthelmintics, rubefacients, and vesicants, among others [7]. Examples of species employed in traditional medicine include *C. rutidosperma* DC., *C. droserifolia* Forssk., *C. viscosa* L., *C. ramosissima* Parl., and *C. spinosa* Jack. Species of *T. spinosa* are widely recognized in Northeast Brazil, where they are known by various common names such as mussambê, mussambê branco, mussambê pequeno, mussambê espinho, sete maria, spider plant, and beijo fedorento. Other synonyms used to describe these species include *Cleome spinosa*, *Cleome hasslerana*, *Cleome houtteana*, *Cleome pungens*, *Cleome arborea*, *Cleome pubescens*, *Cleome tonduzii*, and *Tarenaya spinosa* [8,9].

Species of the Cleomaceae family are generally herbaceous, ranging from subshrubs to shrubs, rarely woody or climbing. Their phyllotaxy is usually simple or occasionally compound, and they feature nectar discs at the base of the receptacle, which can be annular, conical, or obsolete. The capsule or silique is typically regulated by the tension of a gyroscopic structure, either separated or integrated with the opening of the two valves along the suture [10,11].

Morphologically, *Tarenaya longicarpa* is a herbaceous plant often referred to by the synonym *Cleome spinosa* Jacq. in other works [12] (Figure 01). It is characterized by its strong odor, attributed to the presence of secondary metabolites such as essential oils [13,14]. This species is identified by a pair of spines at the base of the petiole and the rough, ornamented surface of its seeds. In traditional medicine, its leaves and roots are widely used to treat various therapeutic conditions, including antiscorbutic and anthelmintic properties. Additionally, the roots are employed in the treatment of respiratory and inflammatory issues, such as cough, asthma, otitis media, and bronchitis [9, 15]. This study aimed to review the common and therapeutic uses of *T. longicarpa*, highlighting its properties against pathogenic microorganisms and inflammatory processes in both traditional medicine and pharmacological contexts.

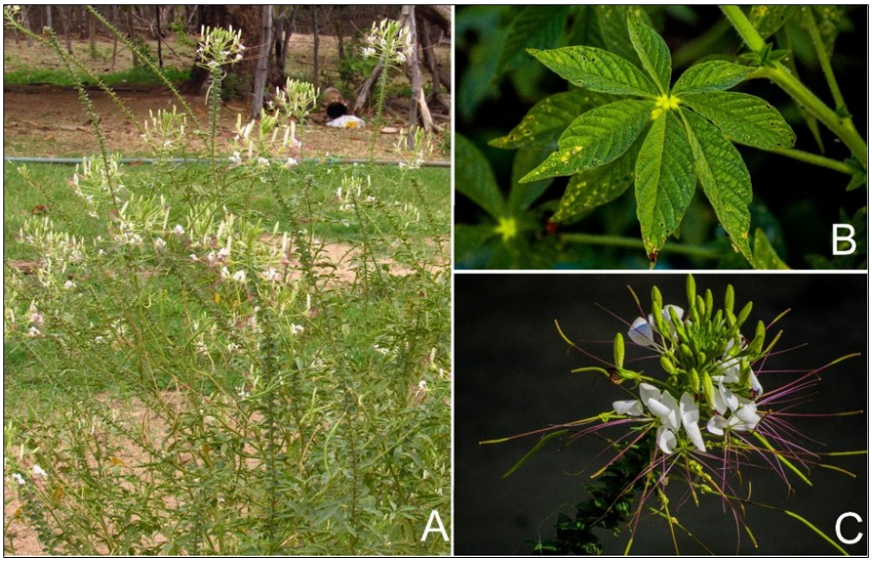

***Figure 1**: Individual of Tarenaya longicarpa (Soares Neto & Roalson) (Cleomaceae). (A) Organisms in an anthropized environment, (B) Palmate-type leaf of the species, (C) Inflorescence of the species.*

2. Methodology

In this article, we describe the anti-inflammatory and antinociceptive potential, as well as some phytochemical properties, of the species *Tarenaya longicarpa*. This study is based on data collected from secondary sources through a bibliographic review. To gather literature articles, searches were conducted in the following databases: DIMENSIONS, SCOPUS, WEB OF SCIENCE, SCIENCE DIRECT, and GOOGLE SCHOLAR.

The search utilized descriptors (*Tarenaya spinosa* OR *Tarenaya longicarpa* OR *Cleome spinosa* OR "mussambê" AND "medicinal plants" OR "medicinal use") and their combinations in Portuguese and English. The inclusion criteria for article selection were: articles published in Portuguese and English; full-text articles addressing the topic relevant to the integrative review; and articles published and indexed in the aforementioned databases between 2010 and 2021. A total of 81 articles were obtained from various scientific sources.

The criteria for selecting reports in this review were as follows:

I. Information on the genus belonging to the Cleomaceae family, using the scientific name accepted in specialized databases and its synonyms.

II. Evidence-based information describing the anti-inflammatory and antinociceptive activities of the Cleomaceae family.

III.Information describing the chemical composition of some genera within the Cleomaceae family.

The taxonomic classification was performed in accordance with Iltis & Cochrane [1].

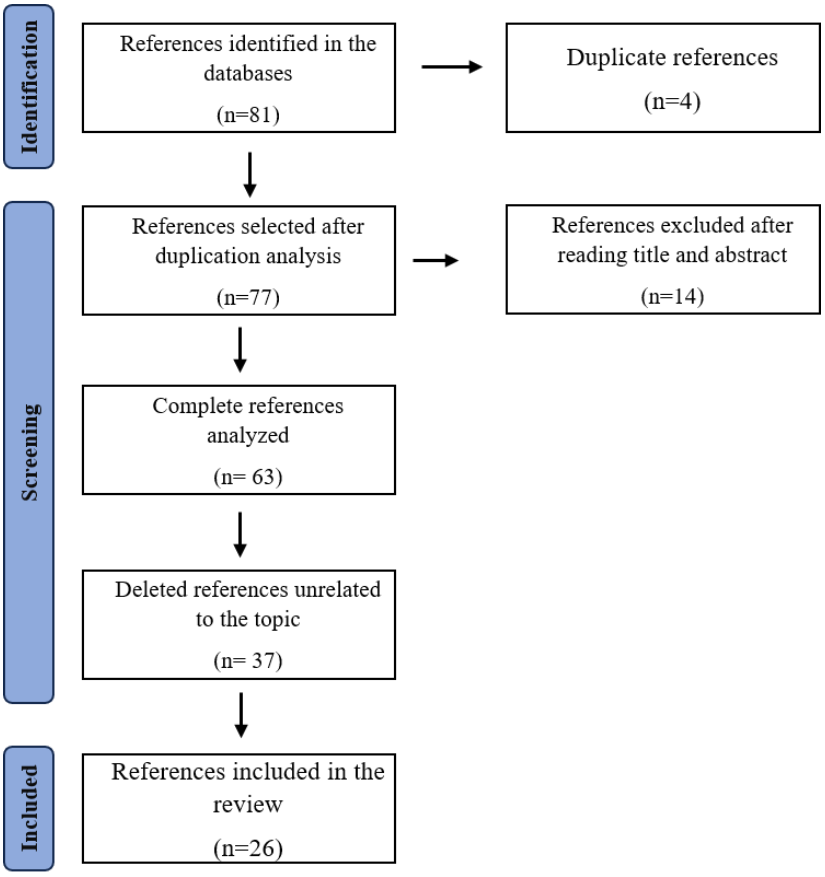

***Figure 2**: PRISMA flow diagram of our review methodology.*

3. Results and Discussion

Based on the methodological steps described above, a general approach can be provided regarding the biological and pharmacological effects of *Tarenaya longicarpa*, as well as its common uses, highlighting key information that supports its potential as a promising medicinal herb for the treatment of various diseases (Table 1).

Table 1. Biological and pharmacological activities of phytochemical components of the species *Tarenaya longicarpa* (Soares Neto & Roalson) (Cleomaceae).

Biological and pharmacological activities	References
Neuroprotective, cytotoxic against several human cancer cell lines, anti-HIV activity	[16-18]
Insecticide; antileishmania	[19]
Antiparasitic	[20-23]
Larvicides and bactericides	[24-25]
Repellent	[26]
Anti-inflammatory and antinociceptive	[27,28]
Antimicrobial	[24, 25, 29]
In ethnobotanical survey studies, the integration of a common body of knowledge on the medicinal uses of *T. longicarpa* is observed (Table 2).	

Table 2. Ethnobotanical use of *Tarenaya longicarpa* (Soares Neto & Roalson) (Cleomaceae) species.

Medicinal use	Plant Part	Reference
Asthma, flu, bronchitis, cough, headache, general inflammation, flatulence, antiseptic, fever	Not reported	[30]
Genitourinary infections in women	Not reported	[31]
Digestive and healing	Not reported	[32,33]
Stimulants, anti-corbutic, anthelmintic, vesicant, carminative and analgesic	Not reported	[7, 34]
Respiratory diseases and inflammatory diseases	Not reported	[33, 35]
Fever	Flowers	[30, 33, 36]
Asthma, cough and bronchitis	Leaves	[37]
Earache, tuberculosis, depurative, flu, expectorant, cough, respiratory problems	Roots, leaves and flowers	[38]

Tarenaya spinosa (Jacq.) Raf., also known as *Cleome spinosa* Jacq. and popularly called "mussambê," is a perennial plant from the Cleomaceae family with medicinal properties. An infusion of its leaves is traditionally used to treat asthma, cough, and bronchitis, while an infusion of its flowers is indicated for fever relief [36, 37, 39]. In folk medicine, species of this genus are employed as stimulants, antiscorbutic, anthelmintic, vesicant, carminative, and analgesic agents [7, 34]. Additionally, literature reports its extracts as having biological activities such as larvicidal and bactericidal effects [24, 25], as well as pharmacological effects including anti-inflammatory and antitumor properties [27].

Scientific studies document antibacterial, insecticidal, and antioxidant activities of essential oils extracted from the aerial parts of *C. spinosa* [24]. Other research has evaluated the anti-inflammatory and antitumor effects of methanolic extracts obtained from various plant cultures [27]. In traditional medicine, *T. spinosa* is used as an alternative herbal medicine, acting as a digestive tonic and for treating respiratory diseases, as well as being applied to suppurative otitis, headaches, wounds, and other conditions [30].

Phytochemical analyses conducted by Silva et al. [25], using leaf extracts with solvents of varying polarity, revealed that *T. spinosa* contains several secondary metabolites, including anthracene derivatives, flavonoids, tannins, monoterpenes, sesquiterpenes, diterpenes, triterpenes, steroids, proanthocyanidins, cinnamic acid derivatives, leucoanthocyanidins, and saponins. These phytoconstituents, originating from the plant's secondary metabolism, may play a crucial role in defense against pathogenic microorganisms, suggesting antimicrobial activities with clinical relevance. Other sources also point to the plant's potential inhibitory activity against bacterial growth [18, 41].

Although the study by Silva et al. [25] demonstrated antibacterial activity in the leaves of *T. spinosa*, this activity should be interpreted cautiously. The extracts used in the study were prepared with low-polarity solvents such as cyclohexane and chloroform, which can influence substance extraction. Extraction with highly polar solvents, such as water and ethanol, may yield different compounds. When Silva et al. [25] used polar solvents, the observed antibacterial activities required very high minimum inhibitory concentrations, suggesting that while antibacterial activity is plausible, it lacks clinical relevance [25, 41, 42].

It is widely recognized that natural products represent a significant source of alternative treatments, with various species of the Cleomaceae family demonstrating notable pharmacological activities, such as antioxidant, analgesic (antinociceptive), anti-inflammatory, antipyretic, antibacterial, anticancer, and other properties [7, 43 - 47]. Organic extracts from various plant parts in the Cleomaceae family, including stems, flowers, roots, seeds, and leaves, have been analyzed in qualitative studies, revealing a variety of secondary metabolites such as polyphenols, flavonoids, coumarins, quinones, carbohydrates, glycosides, alkaloids, steroids, saponins, and terpenes, among others, although not all have been chemically identified [48-50].

The pharmacological potential of *Tarenaya longicarpa* has also been extensively investigated. Phytochemically, the leaves of this species contain compounds such as anthracene derivatives, flavonoids, tannins, monoterpenes, sesquiterpenes, diterpenes, triterpenes, steroids, proanthocyanidins, cinnamic acid derivatives, leucoanthocyanidin, and saponins [15]. Studies also demonstrate the anthelmintic activity of *Tarenaya longicarpa*, a property traditionally recognized and empirically used to treat various conditions [23, 50]. Additionally, anti-inflammatory and antimicrobial activities are reported in the literature [52].

In traditional medicine, species of the *Cleome* genus have been used to treat stomach diseases, as rubefacients, to combat rheumatic fever, and to manage diabetes [53]. Belle [54] demonstrated that the alcoholic extract can be used as an active ingredient in medications or cosmetic preparations, with potential to stimulate hair follicle growth. Collins [18] observed cytotoxicity against various cell lines. Its flowers are traditionally used to treat cough and fever [55], and the infusion of its leaves is commonly employed in the treatment of cough, asthma, and bronchitis [37]. Additionally, its anticancer properties, including activity against leukemia, breast cancer, and colon cancer, have been widely documented.

4. Conclusion

Research indicates that *T. longicarpa* is a highly relevant plant due to its pharmacological and biological effects. In addition to being used as an alternative herbal medicine, it has shown potential to enhance the effects of conventional drugs. In traditional medicine, water-soaked leaves are applied topically to the skin for their analgesic properties, while leaf and flower infusions are effective in treating bronchitis, asthma, and fever. The entire plant also exhibits beneficial effects on the digestive system and general therapeutic properties. Studies demonstrate that leaf extracts, such as those obtained with cyclohexane, chloroform, and ethyl acetate, contain compounds like proanthocyanidins and leucoanthocyanidins. Moreover, metabolic classes such as saponins, flavonoids, tannins, coumarins, and terpenoids are known for their antimicrobial activities, showing significant inhibitory effects against bacteria and fungi. Various pharmacological activities, including antibacterial, anticancer, anti-inflammatory, and anthelmintic properties, have been reported in the literature. In the field of antibacterial activity, the essential oil from the leaves has been shown to significantly inhibit *Streptococcus pyogenes* group A. Based on the popular uses of *C. spinosa*, antibacterial and phytochemical effects have been observed in the leaves and roots of this plant.

However, it is emphasized that further research in ethnobotany is needed to deepen the understanding of the pharmacological and biological activities of *T. longicarpa*, aiming to better integrate traditional and scientific knowledge about its therapeutic uses.

Conflict of Interest

The authors declare no conflict of interest.

References

1. Iltis, H. H.; Cochrane, T. S. Cleomaceae. In *Flora Mesoamericana*; Davidse, G., Sousa, S. S., Knapp, S., Cabrera, F. C., Eds.; Missouri Botanical Garden: St. Louis, 2014; Vol. 2, pp 1–38.
2. Cochrane, T. S.; Iltis, H. H. Studies in the Cleomaceae VII: Five New Combinations in *Corynandra*, an Earlier Name for *Arivela*. *Novon* 2014, *23*, 21–26.
3. Iltis, H. H.; Cochrane, T. S. Studies in the Cleomaceae V: A New Genus and Ten New Combinations for the Flora of North America. *Novon* 2007, *17*, 447–451.
4. Neto, R. L. S.; de Vasconcellos Barbosa, M. R.; Roalson, E. H. *Cleoserrata* (Cleomaceae): Taxonomic Considerations and a New Species. *Phytotaxa* 2017, *324*, 179–186.
5. Rafinesque, C. S. *Sylva Telluriana*; *Philadelphia*, 1838.
6. Pereira, D. A.; Brito, A. C.; Amaral, C. L. F. Biologia Floral e Mecanismo Reprodutivos do Mussambê (*Cleome spinosa* Jacq.) com Vistas ao Melhoramento Genético. *Biotemas* 2007, *20*, 27–34.
7. Bose, A.; Mondal, S.; Gupta, J. K.; Ghosh, T.; Dash, G. K.; Si, S. Analgesic, Anti-Inflammatory, and Antipyretic Activities of the Ethanolic Extract and Its Fractions of *Cleome rutidosperma*. *Fitoterapia* 2007, *78*, 515–520.
8. Hall, J. C. Systematics of Capparaceae and Cleomaceae: An Evaluation of the Generic Delimitations of *Capparis* and *Cleome* Using Plastid DNA Sequence Data. *Botany* 2008, *86*, 682–696.
9. Ferreira, R. T. Efeito Antinociceptivo e Anti-Inflamatório do Extrato Metanólico das Partes Aéreas da *Cleome spinosa* Jacq. (St. hil.) (*Mussambê*) e de Compostos Flavonoides Isolados. (Dissertação), *Universidade Federal Rural do Rio de Janeiro, Seropédica, Rio de Janeiro*, 2011.
10. Tucker, G. C. Neotropical Cleomaceae. In *Neotropikey - Interactive Key and Information Resources for Flowering Plants of the Neotropics*; Milliken, W., Klitgård, B., Baracat, A., Eds. 2009.
11. Iltis, H. H.; Hall, J. C.; Cochrane, T. S.; Sytsma, K. J. Studies in the Cleomaceae I: On the Separate Recognition of Capparaceae, Cleomaceae, and Brassicaceae. *Ann. Mo. Bot. Gard.* 2011, *98*, 28–36.
12. Rodrigues, F. C.; Oliveira, T. P.; Souza, P. R.; Santos, D. M.; Barros, P. T.; Bezerra, J. W. A.; Matias, E. F. F.; Lima, L. F.; Souza, C. R. Chemical Composition and Anti-*Candida* Potential of the Extracts of *Tarenaya spinosa* (Jacq.) Raf. (*Cleomaceae*). *Comp. Immunol. Microbiol. Infect. Dis.* 2019, *64*, 14–19.
13. Forzza, R. C.; Leitman, P. M.; Costa, A. F.; Carvalho, A. A.; Peixoto, A. L.; Walter, B. M. T.; Bicudo, C. E. de M.; Zappi, D.; Costa, D. P. *Catálogo de Plantas e Fungos do Brasil*; Vol. 2; *JBRJ*: Rio de Janeiro, 2010.
14. Maia-Silva, C.; Silva, C. I.; Hrncir, M.; Queiroz, R. T.; Imperatriz-Fonseca, V. L. *Guia de Plantas Visitadas por Abelhas na Caatinga*; Fundação Brasil Cidadão: Fortaleza, 2012.
15. Bezerra, J. W. A.; Oliveira, M. S.; Ferreira, J. V. A.; Sousa, T. S.; Matias, E. F. F.; Lima, L. F. Avaliação da Ação Inseticida e Larvicida do Óleo Essencial de *Tarenaya spinosa* (Jacq.) Raf. (Mussambê) (Cleomaceae). *Rev. Cubana Plant. Med.* 2018, *24*. 1-14.
16. Bouriche, H., Selloum, L., Tigrine, C., & Boudoukha, C. (2003). Effect of Cleome arabica leaf extract on rat paw edema and human neutrophil migration. Pharmaceutical Biology, 41(1), 10-15.
17. Mwai, G. N., Onyangol, J. C., & Onyango, M. O. A. (2002). Potential salinity resistance in spiderplant (Cleome gynandra L.). Sustainable Horticultural Production In The Tropics, 46.
18. Collins, D. O.; Reynolds, W. F.; Reese, P. B. New Cembranes from *Cleome spinosa*. *J. Nat. Prod.* 2004, *67*, 179–183.

19. Bezerra, J. W. A.; Sousa, T. S.; Ferreira, J. V. A.; Rodrigues, F. C.; Oliveira, M. S.; Lima, L. F.; Matias, E. F. F.; Morais-Braga, M. F. B.; Guedes, G. M. M.; Coutinho, H. D. M.; Costa, J. G. M. Evaluation of Antiparasitary, Cytotoxic, and Antioxidant Activity and Chemical Analysis of *Tarenaya spinosa* (Jacq.) Raf. (*Cleomaceae*). *S. Afr. J. Bot.* 2019, *124*, 546 –555.

20. Baldim, J. L., Alcântara, B. G. V. D., Domingos, O. D. S., Soares, M. G., Caldas, I. S., Novaes, R. D., & Chagas-Paula, D. A. (2017). The correlation between chemical structures and antioxidant, prooxidant, and antitrypanosomatid properties of flavonoids. Oxidative Medicine and Cellular Longevity, 2017(1), 3789856.

21. Geroldinger, G., Tonner, M., Hettegger, H., Bacher, M., Monzote, L., Walter, M., Gille, L. (2017). Mechanism of ascaridole activation in *Leishmania*. Biochemical Pharmacology, 132, 48-62.

22. Lima, T. C., Souza, R. J., Santos, A. D., Moraes, M. H., Biondo, N. E., Barison, A., ... & Biavatti, M. W. (2016). Evaluation of leishmanicidal and trypanocidal activities of phenolic compounds from Calea uniflora Less. Natural product research, 30(5), 551-557.

23. Sousa, D. P., Lima, T. C., & Steverding, D. (2016). Evaluation of antiparasitc activity of Mentha crispa essential oil, its major constituent rotundifolone and analogues against Trypanosoma brucei. Planta Medica, 82(15), 1346-1350.

24. McNeil, M. J.; Porter, R. B.; Williams, L. A.; Rainford, L. *Natural Product Communications* 2010, *5*, 1301–1306.

25. Silva, A. P. S.; Silva, L. C. N.; Fonseca, C. S. M.; Araujo, J. M.; Correia, M. T. S.; Cavalcanti, M. S.; et al. Antimicrobial Activity and Phytochemical Analysis of Organic Extracts from *Cleome spinosa* Jacq. *Front. Microbiol.* 2016, *7*, 1–10.

26. Melo, B. A.; de Oliveira, J. E. D.; dos Santos, M. V. G.; da Silva, T. B. G.; da Silva, F. L.; Santiago, G. M. P.; Repellency and Bioactivity of Caatinga Biome Plant Powders Against *Callosobruchus maculatus* (Coleoptera: Chrysomelidae: Bruchinae). *Fla. Entomol.* 2015, *98*, 417–423.

27. Albarello, N.; Simões-Gurgel, C.; Castro, T. C.; Gayer, C. R. M.; Coelho, M. G. P.; Moura, R. S.; et al. Anti-Inflammatory and Antinociceptive Activity of Field-Growth Plants and Tissue Culture of *Cleome spinosa* (Jacq.) in Mice. *J. Med. Plants Res.* 2013, *7*, 1043–1049.

28. Santos, D. A.; Menezes, J. E. S. A. Estudo das Atividades Citotóxica e Antimicrobiana de *Cleome spinosa*, Espécie Nativa do Município de Itapipoca. In *Anais da 57ª Reunião Anual da SBPC*; Fortaleza, CE, 2005.

29. Liporacci, H. S. N.; Simão, D. G. Levantamento Etnobotânico de Plantas Medicinais nos Quintais do Bairro Novo Horizonte, Ituiutaba, MG. *Rev. Bras. Plant. Med.* 2013, *15*, 529–540.

30. Albuquerque, U. P.; Monteiro, J. M.; Ramos, M. A.; Amorim, E. L. C. Medicinal and Magic Plants from a Public Market in Northeastern Brazil. *J. Ethnopharmacol.* 2007, *110*, 76–91.

31. Coelho-Ferreira, M. Medicinal Knowledge and Plant Utilization in an Amazonian Coastal Community of Marudá, Pará State (Brazil). *J. Ethnopharmacol.* 2009, *126*, 159–175.

32. Cabral, S. C. M.; Agra, M. F. Etnomedicina e Farmacobotânica das Capparaceae da Caatinga Paraibana, Brasil. *Braz. J. Pharm.* 1998, *79* (2), 2–6.

33. Agra, M. F.; Baracho, G. S.; Nurit, K.; Basílio, I. J. L.; Coelho, D. V. P. M. Medicinal and Poisonous Diversity of the Flora of "Cariri Paraibano," Brazil. *J. Ethnopharmacol.* 2007, *111*, 383–395.

34. Bose, A.; Mondal, S.; Gupta, J. K.; Dash, G. K.; Ghosh, T.; Si, S. Studies on Diuretic and Laxative Activity of Ethanolic Extract and Its Fractions of *Cleome rutidosperma* Aerial Parts. *Pharmacogn. Mag.* 2006, *2*, 178–182.

35. Conceição, G. M.; Ruggieri, A. C.; Araújo, M. F. V.; Conceição, T. T. M. M.; Conceição, M. A. M. M. *Scientia Plena* 2011, *7*, 1–6.

36. Castro, A. S.; Cavalcante, A. *Flores da Caatinga*; INSA: Campina Grande, 2011.

37. Agra, M. F.; Freitas, P. F.; Barbosa-Filho, J. M. Synopsis of the Plants Known as Medicinal and Poisonous in Northeast of Brazil. *Rev. Bras. Farmacogn.* 2007, *17*, 114–140.

38. Magalhães, K. N.; et al. Medicinal Plants of the Caatinga, Northeastern Brazil: Ethnopharmacopeia (1980–1990) of the Late Professor Francisco José de Abreu Matos. *J. Ethnopharmacol.* 2019, *237*, 314–353.

39. Souza, V. C.; Lorenzi, H. *Botânica Sistemática: Guia Ilustrado para Identificação das Famílias de Angiospermas da Flora Brasileira, Baseado em APG III*; Instituto Plantarum: Nova Odessa, 2012.

40. Silva, C. G.; Marinho, M. G. V.; Lucena, M. F. A.; Costa, J. G. M. Ethnobotanical Survey of Medicinal Plants in the Caatinga Area in the Community of Sitio Nazare, Milagres, Ceara, Brazil. *Rev. Bras. Plantas Med.* 2015, *17*, 133–142.

41. Simões, C. M. O.; Schenkel, E. P.; Gosmann, G.; Mello, J. C. P.; Mentz, L. A.; Petrovick, P. R. *Pharmacognosy: From Plant to Medicine*; Editora da UFRGS/Editora da UFSC: Porto Alegre/Florianópolis, 2010.

42. Martins, C. R.; Lopes, W. A.; Andrade, J. B. Solubility of Organic Substances. *Quim. Nova* 2013, *36*, 1248–1255.

43. Djeridane, A.; Yousfi, M.; Brunel, J. M.; Stocker, P. RETRACTED: Isolation and Characterization of a New Steroid Derivative as a Powerful Antioxidant from *Cleome arabica* in Screening the in Vitro Antioxidant Capacity of 18 Algerian Medicinal Plants. *Food Chem. Toxicol.* 2010, *48*, 2599–2606.

44. Bose, A.; et al. Diuretic and Antibacterial Activity of Aqueous Extract of *Cleome rutidosperma*. *Indian J. Pharm. Sci.* 2007, *69*, 292–297.

45. Bose, U.; Bala, V.; Ghosh, T. N.; Gunasekaran, K.; Rahman, A. A. Antinociceptive, Cytotoxic, and Antibacterial Activities of *Cleome viscosa* Leaves. *Rev. Bras. Farmacogn.* 2011, *21*, 165–169.

46. Ranjitha, J.; Shalma, M.; Donatus, M.; Vijayalakshmi, S. Isolation of Novel Phytoconstituents from the Stem Part of *Cleome gynandra* Linn. and Their Antimicrobial Activity. *Int. J. Phytomed.* 2014, *6*, 341–345.

47. Tigrine, C.; Bulzomi, P.; Leone, S.; Bouriche, H.; Kameli, A.; Marino, M. *Cleome arabica* Leaf Extract Has Anticancer Properties in Human Cancer Cells. *Pharm. Biol.* 2013, *51*, 1508–1514.

48. El-Wahab, M. F. A.; Mudawi, M. M. E.; Fatima, N.; Alshammari, A. N. Analgesic Effects and HPLC Fingerprinting of *Cleome africana* Botsch. Extracts. *Int. J. Biol. Biotech.* 2016, *13*, 529–535.

49. Singh, H.; Ali, S. S.; Khan, N. A.; Mishra, A.; Mishra, A. K. Wound Healing Potential of *Cleome viscosa* Linn. Seeds Extract and Isolation of Active Constituent. *S. Afr. J. Bot.* 2017, *112*, 460–465.

50. Alamilla-Fonseca, L. N.; Delgado-Domínguez, J.; Zamora-Chimal, J.; Cervantes-Sarabia, R. B.; Jiménez-Arellanes, A.; Rivero-Cruz, J. F.; Becker, I. *Leishmania mexicana* Cell Death Achieved by *Cleoserrata serrata* (Jacq.) Iltis: Learning from Maya Healers. *J. Ethnopharmacol.* 2018, *211*, 180–187.

51. Andrade, F. D.; Ribeiro, A. R. C.; Medeiros, M. C.; Fonseca, S. S.; Athayde, A. C. R.; Ferreira, A. F.; et al. Anthelmintic Action of the Hydroalcoholic Extract of the Root of *Tarenaya spinosa* (Jacq.) Raf. for *Haemonchus contortus* Control in Sheep. *Pesq. Vet. Bras.* 2014, *34*, 942–946.

52. Silva, A. P. S. Avaliação do Potencial Antimicrobiano *in vitro* e Anti-Inflamatório *in vivo* do Extrato de *Cleome spinosa* Jacq. (Dissertação), *Universidade Federal de Pernambuco*, 2012.

53. El-Askary, H. I. Terpenoids from *Cleome droserifolia* (Forssk.) Del. *Molecules* 2005, *10*, 971–977.

54. Belle, R.; Belaubre, F. *Cleome spinosa* Extract Used in Pharmaceutical and Cosmetic Compositions. *PCT Int. Appl.,* 2008. 1-4.

55. Albuquerque, U. P.; Monteiro, J. M.; Ramos, M. A.; Amorim, E. L. C. Medicinal Plants of the Caatinga (Semi-Arid) Vegetation of NE Brazil: A Quantitative Approach. *J. Ethnopharmacol.* 2007, *114*, 325–354.